

Army Corrosion Prevention and Control (CPC) Program for *Facilities and Infrastructure*

Dr. Craig E. College

**Deputy Assistant Chief of Staff for
Installation Management (DACSIM)**



Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE FEB 2010		2. REPORT TYPE		3. DATES COVERED 00-00-2010 to 00-00-2010	
4. TITLE AND SUBTITLE Army Corrosion Prevention and Control (CPC) Program for Facilities and Infrastructure				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Office of Assistant Chief of Staff for Installation Management (DACSIM), Washington, DC, 20301				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES 2010 U.S. Army Corrosion Summit, Huntsville, AL, 9-11 Feb					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 13	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

ARMY UNIVERSE

(Data collected 30 Sep 09)

Land Acreage

• United States	13,506,291
• Europe	139,981
• Asia	21,405
• Other Overseas	15,309

Roads (paved and unpaved)

59,286 Miles

Paved Area (excluding roads)

423 Million square yards

Railroads

2,522 Miles

Family Housing Units

• Owned	18,721
• Leased	8,544
• Privatized	86,092
• Conveyed	79,477

Barracks

Adequate Spaces

• Permanent Party	150K
• Training	5K
• ORTC	112K

Plant Replacement Value

\$296B

Army Installations

• IMCOM	74
• Army Reserves	4
• National Guard	47
• AMC	30
• SMDC	1
• MEDCOM	2
• DLA	5
TOTAL	163

Army Demographics

58% married
8.9% dual military
6.7% single parents
854,112 family members

Environmental Clean-up Remaining *(Installation Restoration Program & Military Munitions Response Program)*

• Active Sites	1,327
• BRAC Sites	318
• Formerly Used Defense Sites	1,953

Army End-Strength

Active	549,015
USAR	205,297
ARNG	358,391
Civilians	245,248
Retired	838,927

Airfield

- 145 Fixed Wing
- 738 Heliports

Buildings

(Million square feet)

• United States	796
• Europe	117
• Asia	34
• Other	7

Utilities

Electric, gas,
water and sewer

- 68,613 Miles

FY09 Installation Management Resources = \$28B

(Including \$3B -American Recovery and Reinvestment Act Funding (ARRA))

War on Corrosion

- The 2007 DoD Cost of Corrosion Study determined that the total cost of corrosion for both equipment and infrastructure was \$20 billion/year
- Corrosion of facilities and infrastructure costs the DoD approximately \$1.8 billion/year (FY05 dollars).
 - ▶ 15.1% of the total maintenance budget
- The cost of corrosion in Army facilities and infrastructure was approximately \$0.45 billion/year (FY05 dollars).
 - ▶ 15.8% of the total maintenance budget
 - ▶ Based on Army FY09 SRM, that equates to over \$.5 billion/year

Army Corrosion Prevention and Control Program (CPC)

Facilities & Infrastructure

- Reduce life-cycle cost of facilities and infrastructure
 - ▶ Develop strategy for implementing CPC within the Army acquisition life cycle
 - Develop and implement policy and guidance on corrosion prevention and control for Army facilities.
 - Provide guidance for improving maintenance and training in corrosion.
 - Prioritize science and technology requirements to advance the state of the art.
 - Ensure that CPC is fully considered throughout the asset life cycle.

INFRASTRUCTURE ACQUISITION LIFE CYCLE

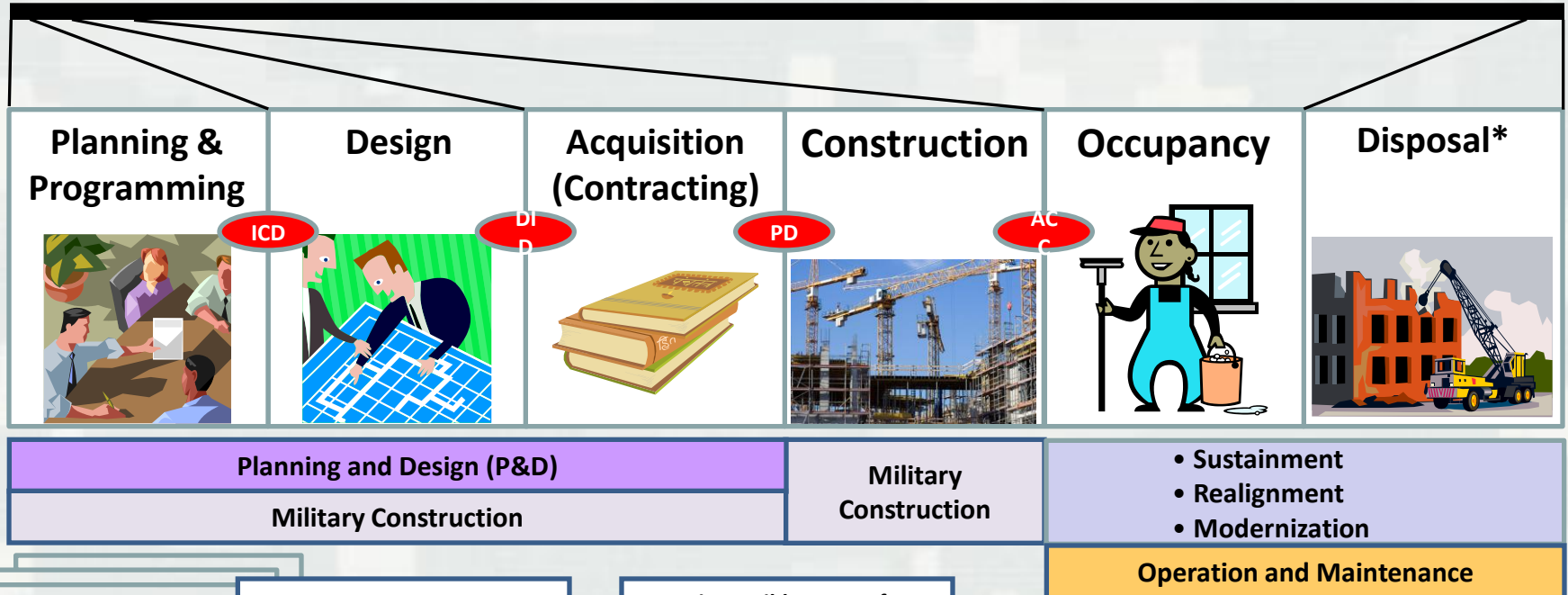
RDTE 6.1 (Basic Research)

RDTE 6.2 (Applied Research)

0 1 3 6

Time (years) →

73 75



DD 1390, DD 1391,
Military Construction
Program/Project Data

Unified Facilities
Criteria (UFC)

Unified Facilities
Guide Specifications
(UFGS)

Industry
Standards

Design-Build Request for
Proposal (RFP)

Construction Contract
Documents

Maximum impact on facility life
cycle costs at planning and
design stage

ICD = Initial Capabilities Document
DID = Design Intent Document
PD = Procurement Documents
ACC = Acceptance / Beneficial Occupancy

* Reduce, Reuse, Recycle

Systemic problems will not be solved by individual technical solutions

Army Facilities CPC Program

- Technology Demonstration

- ▶ Validate benefits
- ▶ Develop engineering guidance



- Supports

- ▶ Readiness
- ▶ Sustainability
- ▶ Safety



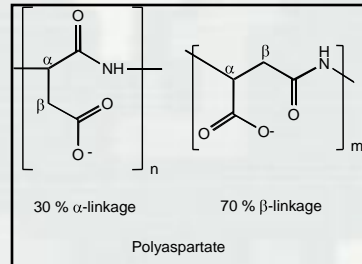
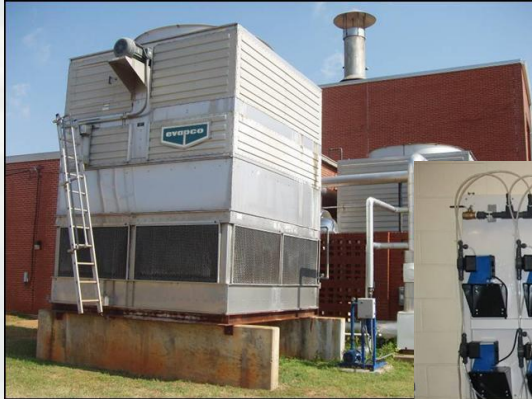
Army Investments

Funds expended on corrosion prevention and control through the OSD Program:

Army Facilities CPC Program Funding Summary

	OSD (\$000)	Service Match (\$000)	Installation Supplemental (\$000)	Total Funding (\$000)
FY09	5,357	5,000	1,120	11,477
FY08	3,853	5,000		8,853
FY07	4,050	5,000		9,050
FY06	4,430	5,000	336	9,766
FY05	4,540	3,905	700	9,145
Total	22,230	23,905	2,156	48,291

AR-F-314 Green Chemical Treatment and Smart Control System for Heating and Cooling Systems



- **Where:** Ft. Rucker, Ft. Hood, Red River Army Depot, Redstone Arsenal, and Brooke AMC
- **When:** FY 2005 - 2006
- **Benefits:** Reduced corrosion and fouling of boilers and cooling towers, greater energy efficiency and reduced environmental impact.
- **Cost:** \$2,600K
- **ROI:** 13
- **Payback:** 2.6 years

F07AR19 – Epoxy Coating System Formulated with Carbon Nanotubes



- **Where:** Ft. Bragg, NC
- **When:** FY 2007 - 2008
- **Benefits:** **Improved** coating performance (flexibility, impact resistance, adhesion). Reduced use of heavy metal pigments.
- **Cost:** \$950K
- **ROI:** 8
- **Payback:** 3.7 years

F08AR13: Remote Structural Health and Degradation Monitoring of Bridges

Steel Bridges

Rock Island Arsenal



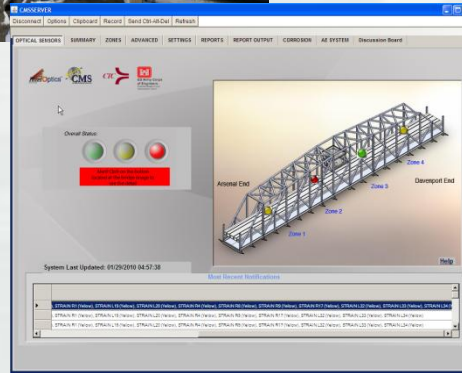
I-20 Vicksburg, Mississippi



Thermoplastic Composite Bridges

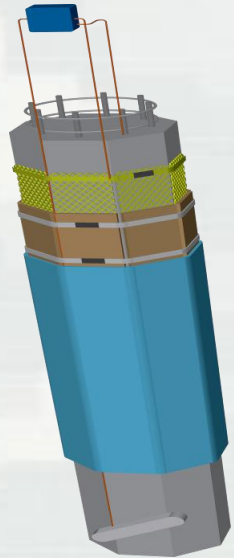


Fort Bragg, NC



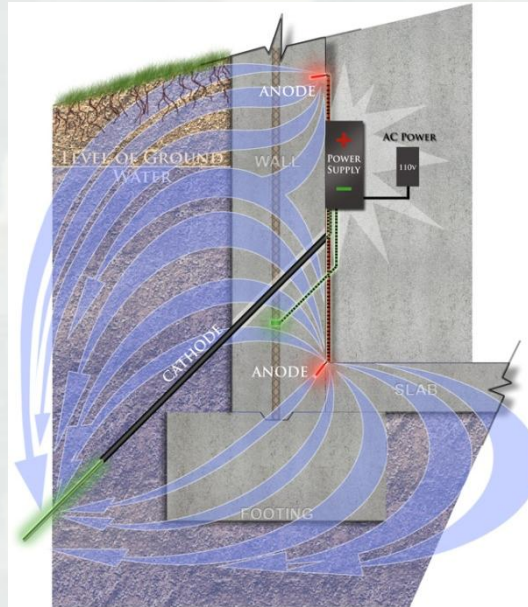
- **Where:** Rock Island Arsenal, I-20 Vicksburg, Mississippi, and Fort Bragg, NC
- **When:** FY2008 - 2010
- **Benefits:** Real time assessment of the condition of critical steel bridge infrastructure and warning of degradation processes that could cause failure. Assessment of long-term performance of innovative thermoplastic composite timber bridges.
- **Cost:** \$2,183K
- **ROI:** 26
- **Payback:** 1.2 years

F08AR07: Polymer Composite Wrapping and Galvanic Cathodic Protection System for Pilings



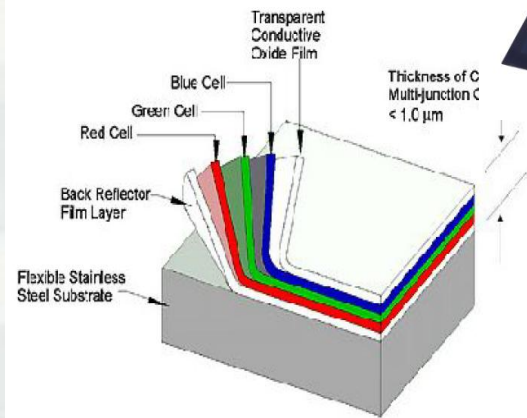
- **Where:** Kawaihae Harbor, HI
- **When:** FY2008 - 2010
- **Benefits:** Polymer composite pile wrap that incorporates galvanic cathodic protection system provides corrosion resistance to steel reinforcements as well as impact and abrasion resistance.
- **Cost:** \$1,092K
- **ROI:** 16
- **Payback:** 1.9 years

F08AR23: EOP & Dehumidification Technologies in Ammunition Bunkers



- **Where:** Kawakami Ammunition Depot, Japan and Naval Ordnance Station, Guam
- **When:** FY2009 - 2010
- **Benefits:** Stop water intrusion into earth covered magazines; maintain interior relative humidity to prevent corrosion and biological growth.
- **Cost:** \$1,205K
- **ROI:** 59
- **Payback:** 0.5 years

F09AR04: Corrosion Resistant Roofs with Integrated Sustainable PV Power Systems



- **Where:** Kilauea Military Camp, HI
- **When:** FY2009 - 2011
- **Benefits:** Metal roofs with high performance coatings and thin film laminate PV appliques can provide corrosion resistant sustainable roofs and cheap electric power.
- **Cost:** \$688K
- **ROI:** 20
- **Payback:** 1.7 years

F09AR16: Lightweight Fiber Reinforced (Thermoset) Polymer Composite Bridge Decks as Replacement for Steel Reinforced Concrete Decks



- **Where:** Redstone Arsenal, AL
- **When:** FY2009 - 2011
- **Benefits:** Reduced corrosion due to elimination of metallic rebar, reduced weight equates to reduced dead load and increased dynamic live load, low maintenance.
- **Cost:** \$850K
- **ROI:** 10
- **Payback:** 3.0 years

Technology Transfer is Key

- Technology-specific updates to UFCs, TMs, ETLs, and other relevant criteria documents
- Incorporation into Installation Design Standards
- Inclusion in industry standards such as ACMA, ASTM, AASHTO, NACE, AWWA, ICRI
- International data exchange agreements concerning corrosion prevention, control and mitigation:
 - ▶ Australian DoD (executed)
 - ▶ UK Ministry of Defense and Germany (in development)
- Cooperative Research & Development Agreements (CRADAs) with Industry

Challenges

- R&D
- Technology Transfer
- Funding
- Training/Awareness